TECHNICAL REVIEWERS' COMMENTS
LRC-XLIII-A

"Lignite Vision 21 Feasibility Project";
Submitted by: Great Northern Power Development L.P.;
Project Manager: Gerald E. Vaninetti;
Request for: $673,250; Total Project Cost: $1,346,500.

1. **OBJECTIVES**

The objectives or goals of the proposed project with respect to clarity and consistency with Industrial Commission/Lignite Research Council goals are: 1 - very unclear; 2 - unclear; 3 - clear; 4 - very clear; or 5 - exceptionally clear.

Reviewer 01-17 (Rating: 5)

Successful development of a 500 MW lignite-fired power plant beginning operation in 2008 will go a long way to meeting the goal of increasing the use of North Dakota lignite and providing a significant number of new jobs.

Reviewer 01-18 (Rating: 4)

The proposed activity would result in due diligence to allow the proposer to make the decision in September 2002, whether or not to proceed with construction of a 500 MW lignite-fired power plant. The schedule in the proposal would result in a 500 MW lignite plant online by 2008.

Reviewer 01-19 (Rating: 3)

Apparently, a purpose for the project is to demonstrate a competitive alternative to the two other LV 21 projects in the event three 500 MW units at three sites have coincident markets.

Reviewer 01-20 (Rating: 4)

The project meets the goals of the Lignite Research Council Vision 21 program in proposing a feasibility study to develop a new mine and power plant in an area of the state where no coal conversion facilities currently exist.

Reviewer 01-21 (Rating: 4)

The purpose of Great Northern Power's project is very clear and includes several feasibility studies that will be conducted for a proposed 500 MW lignite-fired, mine-mouth power plant in southwestern North Dakota. The facility would most likely be sited near South Heart, but two other sites will also considered, one near New Salem and the other northwest of Dickinson. These feasibility studies would be conducted over the next ten months. The total cost of the feasibility studies is $1,346,500, with $673,250 (50%) requested from the Industrial Commission. No funds are being requested at this time for design and actual construction activities, but Great Northern Power plans to request additional matching funds, up to $10 million total, if the studies show it is feasible to construct a power plant. Great Northern Power estimates that the total costs to construct a new 500 MW plant by 2008 would be around $700 million.

2. **ACHIEVABILITY**

With the approach suggested and time and budget available, the objectives are: 1 - not achievable; 2 - possibly achievable; 3 - likely achievable; 4 - most likely achievable; or 5 - certainly achievable.

Reviewer 01-17 (Rating: 4)

The ten-month schedule for the feasibility study and the budget of $1,364,500 is most likely achievable.

Reviewer 01-18 (Rating: 3)

The schedule noted is very aggressive, but can be achieved. The concern I have is that no mention is made of the response of potential utility/IPP partners to the proposed GNPD lead development. GRE and MDU are already moving ahead with their own proposed projects and it is unclear if they are interested in the GNDP project. Since GNPD is proposing to retain up to 20% of the project, at least 80% is still unaccounted for.

Reviewer 01-19 (Rating: 4)

The work approach, schedule, etc., is provided by consultant Black & Veatch in Appendix C. The schedule is aggressive, as it apparently intends to complete Phase I on time lines concurrent with the two other LV 21 projects.

Reviewer 01-20 (Rating: 4)

The proposer's of the project have little direct involvement with the project investigation and project activities, instead using consultants exclusively for developing the work. The coordination of seven consultants to do that work on a timely basis will require aggressive project management effort. The project feasibility manager does have great deal of local knowledge, which may help bring continuity to the project. The budget seems to be generous, especially if some of the consultant work will be incremental work as suggested in the proposal.

Reviewer 01-21 (Rating: 3)

The feasibility studies for building a new power plant can be carried out as proposed by Great Northern Power. However, there is at least one major obstacle that must be overcome in order to construct a power plant near South Heart and that is the proximity of the site to the Theodore Roosevelt National Park, which is designated as a Class I air area. Another major concern that I have with this project is the availability of sufficient water in the area to meet the needs of a 500 MW class power plant. While the water quality concerns are addressed to some degree, there is little discussion on the quantity of water that would be needed and its availability in the area. Other uncertainties with building a power plant include identifying specific markets for the electricity, transmission issues, and wastewater treatment costs to meet effluent standards.

3. **METHODOLOGY**

The quality of the methodology displayed in the proposal is: 1 - well below average; 2 - below average; 3 - average; 4 - above average; or 5 - well above average.

Reviewer 01-17 (Rating: 5)

The approach suggested by each of the selected subcontractors is excellent with all the key project concerns addressed.

Reviewer 01-18 (Rating: 3)

The proposed project will result in the due diligence to determine if a project can go forward, provided motivated partners can be identified. To assure that the state's investment is appropriate, one should know that GNPD has had favorable responses from the potential partners identified in the proposed project.

Reviewer 01-19 (Rating: 4)

(Note: Reviewer 01-19 provided no comments.)

Reviewer 01-20 (Rating: 3)

The methodology is adequate in that it identifies the key issues of such a feasibility study.

Reviewer 01-21 (Rating: 3)

Overall, the methods for feasibility studies appear very good. The proposed studies for an environmental assessment of the site, mine analysis, generation technologies, transmission, marketing strategy, and the economic/financial analysis are well described. Independent air modeling will be carried out as part of the study as well as verifying the Health Department's emission inventory for the Class I area around the Theodore Roosevelt National Park.

While an assessment of water quality in the area was briefly addressed in the Fatal Flaw Analysis, I question whether or not sufficient water is available near the South Heart site to meet the needs of a 500MW class power plant. The primary water source mentioned in the Fatal Flaw Analysis for meeting the needs of a power plant in this area is the Fox Hills Sand aquifer that could produce water at a rate of 150 to 200 gallons per minute. At this pumping rate, it appears between 240 and 320 acre-feet of water would be available for the annual water needs of the power plant. In comparison, MDU estimated that between 5,000 and 6,000 acre-feet of water would be needed on an annual basis for its Lignite Vision 21 project near Gascoyne. Also, the cost for treating water obtained from the Fox Hills aquifer may be substantial and the possibility of uranium being present in the water was noted as another concern. Due to the lack of additional plans for studying the water availability issue, I gave this project an average rating for methodology rather than above or well above average.

4. **CONTRIBUTION**

The scientific and/or technical contribution of the proposed work to specifically address Industrial Commission/LRC goals will likely be: 1 - extremely small; 2 - small; 3 - significant; 4 - very significant; or 5 - extremely significant

Reviewer 01-17 (Rating: 2)

This project will provide two sets of comparative assessments. The first set, which is to be done in great detail, will compare PC and CFB technologies. The second will be done in somewhat less detail and compare three entrained bed gasification technologies (E-Gas, Shell and Texaco). It is not clear how the results of these two sets of analyses will be compared with one another. However, a comparison of these five different technologies using a single type of lignite at a specific site will be an interesting technical contribution if published in the open literature.

The proposal indicates that all comparisons of technology will be done so that existing environmental standards can be met. One of the interesting aspects that should be covered in the comparative assessment are the differences among these technologies in terms of meeting potential future emission limits for Hazardous Air Pollutants including mercury, PM2.5 and CO2. There is some risk that a power plant beginning operation in 2008 may be subjected to more stringent emission regulations than exist today.

Reviewer 01-18 (Rating: 4)

If the proposed activity goes forward it would result in a greenfield 500-1000 MW plant. This would meet all of the NDIC goals.

Reviewer 01-19 (Rating: 4)

(Note: Reviewer 01-19 provided no comments.)

Reviewer 01-20 (Rating: 5)

The major contribution of this project is determining the feasibility of a lignite conversion facility in an area without a significant surface water supply and in the near proximity of the Teddy Roosevelt National Park. If such a plant could be sited economically and environmentally, it would create an opportunity for many other lignite conversion facilities at other green field sites in North Dakota.

Reviewer 01-21 (Rating: 4)

Any new lignite-fired power plant that is constructed using some of the latest clean coal combustion technology and environmental controls would provide significant contributions that address Industrial Commission/Lignite Research Council goals. The transmission study will look at increasing the power transfer capacity between the Mid America Power Pool (MAPP) and Western Systems Coordinating Council (WSCC). Great Northern Power will look at upgrading existing WAPA lines currently connecting these two regions in order to serve both power markets. Also, the transmission study will include the potential for integrating wind generation as a green component.

5. **AWARENESS**

The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 - very limited; 2 - limited; 3 - adequate; 4 - better than average; or 5 - exceptional.

Reviewer 01-17 (Rating: 3)

This is not a scientific project. However, the methodologies suggested by the subcontractors appear to be at the state of the art for feasibility studies, market assessments, mining plans, etc.

Reviewer 01-18 (Rating: 4)

The proposed activity is not research, so this question does not apply as stated. The investigators noted appear well versed in the issues and potential solution strategies to have a successful project.

Reviewer 01-19 (Rating: 4)

This proposal, as did other LV 21 proposals, lacks sensitivity regarding visibility impairment in addition to Class One sulfur dioxide increment issues. Regulations provide for federal land manager determination of impacts on air quality related values irrespective of status of attainment of Class One area increments.

Reviewer 01-20 (Rating: 4)

The principal investigator has a great deal of experience in the coal development activity, but seems less aware in the many other aspects of this project. However, the project feasibility manager appears to have a broader base of awareness of the project activities and local knowledge of the project area.

Reviewer 01-21 (Rating: 3)

Not many research publications are referenced in the proposal, but this may not be that applicable for a Lignite Vision 21 project.

6. **BACKGROUND**

The background of the investigator(s) as related to the proposed work is: 1 - very limited; 2 - limited; 3 - adequate; 4 - better than average; or 5 - exceptional.

Reviewer 01-17 (Rating: 4)

All of the investigators and subcontractors appear to be extremely well qualified to carry out the work professionally and expeditiously.

Reviewer 01-18 (Rating: 3)

The proposed team includes people well prepared to complete the proposed project, including the principal investigator (Black & Veatch). The project manager has a proven track record in developing mining projects. It is not clear the project managers have experience in developing combined mining/power plant projects of this size.

Reviewer 01-19 (Rating: 4)

(Note: Reviewer 01-19 provided no comments.)

Reviewer 01-20 (Rating: 4)

Consultants who all are qualified in their contracted area will do nearly all the investigation. Most of the proposed consultants have performed a number of North Dakota lignite projects in the past.

Reviewer 01-21 (Rating: 4)

The consulting firms that Great Northern Power has selected to carry out the feasibility studies each have a good background for the tasks that they will carry out.

7. **PROJECT MANAGEMENT**

The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any is: 1 - very inadequate; 2 - inadequate; 3 - adequate; 4 very good; or 5 - exceptionally good.

Reviewer 01-17 (Rating: 4)

The project is extremely well organized with all appropriate aspects for the feasibility study covered.

Reviewer 01-18 (Rating: 4)

The milestone chart included presents a well-defined plan to complete the proposed study.

Reviewer 01-19 (Rating: 4)

(Note: Reviewer 01-19 provided no comments.)

Reviewer 01-20 (Rating: 3)

The milestone chart has no elements identified between the October 2001 Kick-Off of the feasibility study and the August 2002 completion of the Technical Studies. There is no discussion of how the communication between the consultants, other LRC Vision 21 applicants referenced in the proposal and the principal investigator will be conducted. The financial plan identifies the budgeted cost of the individual contractors and the proposer's management costs with NDIC paying for 50% of the project.

Reviewer 01-21 (Rating: 4)

The management plan is well defined. The goal is to have the studies completed within ten months and to make a decision by September 2002 on whether or not to construct a power plant.

8. **EQUIPMENT PURCHASE**

The proposed purchase of equipment is: 1 - extremely poorly justified; 2 - poorly justified; 3 - justified; 4 - well justified; or 5 - extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 01-17 (Rating: 5)

No equipment is required.

Reviewer 01-18 (Rating: 5)

No equipment will be purchased.

Reviewer 01-19 (Rating: 5)

No equipment purchases were noted for Phase I.

Reviewer 01-20 (Rating: 5)

No equipment will be purchased.

Reviewer 01-21 (Rating: 5)

No equipment will be purchased for this proposal.

9. **FACILITIES**

The facilities and equipment available and to be purchased for the proposed research are: 1 - very inadequate; 2 - inadequate; 3 - adequate; 4 - notably good; or 5 - exceptionally good.

Reviewer 01-17 (Rating: 4)

No facilities and equipment are required for this project since it involves no experimental work. The computer programs that will be used by the subcontractors selected to do this work appear to be excellent.

Reviewer 01-18 (Rating: 4)

The proposed consultants will have the appropriate equipment to complete the project as outlined.

Reviewer 01-19 (Rating: 3)

(Note: Reviewer 01-19 provided no comments.)

Reviewer 01-20 (Rating: 5)

No facilities or equipment required or purchased.

Reviewer 01-21 (Rating: 5)

No special equipment or research facilities are needed for the feasibility studies that are proposed.

10. **BUDGET**

The proposed budget "value" [1] relative to the outlined work and the financial commitment from other sources [2] is of: 1 - very low value; 2 - low value; 3 - average value; 4 - high value; or 5 very high value.

Reviewer 01-17 (Rating: 4)

The 50% cost sharing offered by the proposer is significant. About 1/3 of that cost share represents an in-kind contribution of the in-house efforts associated with this project. The balance will be used to pay part of the costs of the sub-contractors.

Reviewer 01-18 (Rating: 3)

The proposer has requested 50% cost share, the maximum allowed. The sponsors' portion of the proposed project includes in-kind cost of roughly 20% of the total project costs.

Reviewer 01-19 (Rating: 3)

The objectives and work plan do not discreetly describe Phase I contributions to the two LV 21 projects already approved.

[1] "Value" – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar.

[2] Financial commitment from other sources – A minimum of 50% of the total project must come from other than Industrial Commission sources to meet the program guidelines. Support greater than 50% from Industrial Commission sources should be evaluated as favorable to the application.

Reviewer 01-20 (Rating: 4)

The completion of the feasibility portion of this project would be of value to the State of North Dakota in determining the ability to locate a lignite conversion facility near the Teddy Roosevelt National Park and without a surface water source readily available. The budget seems quite generous for the work to be done, some of which may be incremental work.

Reviewer 01-21 (Rating: 2)

The funding requested by Great Northern Properties for the feasibility studies is 50% of the total costs, the same as that approved for feasibility studies associated with Great River Energy's Lignite Vision 21 project. However, the air quality issue is a major obstacle that must be overcome before a power plant could be built as proposed by Great Northern Properties. Also, the Henwood and RDI proposals for assessing the electricity market would look into the feasibility of constructing a power plant in eastern Montana as well as western North Dakota. If funding for this project is approved and Great Northern Power selects Henwood or RDI for the market study, it is my recommendation that the Montana component be deleted from this study as a condition for Industrial Commission funding.

OVERALL COMMENTS AND RECOMMENDATION:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

Reviewer 01-17 (Recommendation: FUND)

The proposal, which is a feasibility study, should be funded. It has the potential to lead to a new 500 MW power plant fueled with relatively low-cost lignite. The currently favored site has the potential to be expanded to 1000 MW. The technology currently favored by the proposer is a CFB system with two 250 MW boilers. This is similar to the design of a recently completed 500 MW lignite-fired power plant in Mississippi.

The project will not break new ground in terms of technology. If it actually proceeds to construction based on CFB technology, it will demonstrate that technology with North Dakota lignite at full commercial scale.

Reviewer 01-18 (Recommendation: FUNDING MAY BE CONSIDERED)

GNPD has control of significant lignite resources in the state of North Dakota and, therefore, has the potential (including financial resources) to be a significant contributor to the proposed Lignite Vision 21 initiative. They have clearly demonstrated the ability to develop a successful mining operation. It is not clear from the proposal that partners to own/operate the proposed power plant are on board with the GNPD project. I believe it is important that the NDIC technical representative determine the likelihood that the partners required for the proposed development will be identified, with assurance that these partners are committed prior to approval of the requested funds.

Reviewer 01-19 (Recommendation: FUNDING MAY BE CONSIDERED)

If funded, Great Northern Power – along with Great River Energy and MDU/Westmoreland should be required to participate in a findings conference scheduled for the fall of 2002. The conference would inform the Industrial Commission, local and state officials and state licensing agencies.

This project has a similar vested interest in air quality - particularly impacts in Class One areas - as funded LV 21 projects. Therefore, if funded, the three projects must arrive at common assessments of existing Class One air quality conditions. It is conceivable that a first-in-time first-in-line issue could emerge in resolution of Class One area sulfur dioxide increments exceedances.

Reviewer 01-20 (Recommendation: FUND)

The project proposal is a standard feasibility study for a coal-fired power plant. The suggestion that a CFB unit has the same economics as a PC unit and that they will be interchangeable in the feasibility study is questionable. The investigation of integrating this project with a wind power project seems to be immaterial and mostly a "politically correct" statement.

The Project Developer is to be commended for its commitment to coordinate and work with the other NDIC/LRC Vision 21 applicants in order to reduce overlap and consulting costs. Also, it is refreshing to see a project proposed in a challenging green field site that should help bring into focus where new lignite-fired generation can be located. For that reason, it is recommended that this project be funded.

Reviewer 01-21 (Recommendation: FUNDING MAY BE CONSIDERED)

The feasibility studies for building a new power plant near South Heart can be carried out as proposed by Great Northern Power. While this project meets the Lignite Vision 21 criteria, there are several obstacles that must be overcome before a power plant could be constructed. The most significant obstacle to overcome is the proximity of the site to the Class I air designation around Theodore Roosevelt National Park and the ability to permit new source SO2 emissions. Great Northern Power will be studying different options to address this "formidable obstacle" as described in the Fatal Flaw Analysis that has been conducted. Another significant issue for this project is the availability of sufficient water in the area to meet the needs of a 500 MW class power plant. If the Industrial Commission decides to fund this project, I recommend including a condition that the water availability issue be addressed as part of the feasibility studies and that the Montana location be deleted from the market study.